

Topical Group on Few-Body Systems and Multiparticle Dynamics

Newsletter, June 2010



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● MESSAGE FROM THE CHAIR

Greetings to all members of the Few-Body Topical Group (GFB) and best wishes for the coming year.

Last year, for the 25-th year of the Few-Body Topical Group, our past Chair Wayne Polyzou had organized an extended newsletter. It included an article by Professor Frank Levin of Brown University on the founding of our Topical Group and articles on recent advances in few body physics in both atomic and nuclear physics. I recommend these articles to those of you who have missed reading them.

Recently, Chris Greene (Colorado) has published an excellent *Universal insights from few-body land* in Phys. Today 63 (3), 40 (March 2010). He gives a very clear pedagogical account of experimental and theoretical developments in three- and four-body assemblies of cold atoms. The illustrations in the article are themselves very instructive. The universality refers to Efimov and related physics that is largely independent of the short-range forces

between the bodies, applicable equally on MeV scales for nucleons and sub-eV for cold atoms and molecules. It grows out of the pioneering work of Wigner who emphasized that low energy physics with short-range forces is insensitive to their details, with the same threshold laws applying to nucleons as they do to photodetachment of atomic or molecular negative ions even though the interactions and energies involved are completely unrelated. Reflecting as it does the unity of physics across disparate fields, it is a theme of central importance to our Topical Group.

This year marks the fiftieth anniversary of the laser, the first observation having been on May 16, 1960 by Theodore Maiman and his co-workers. Lasers have ubiquitous roles in few-body physics as they do in all physics and in the world we live in. At a recent Unit Convocation of the APS, it was noted that up to 50% of the US national GDP may be attributed to lasers! The next time you play a CD of music, or pull out a laser-pointer from your pocket, or pay for goods or service with a scan at a counter, or board a flight, pause for a moment to reflect on the role of lasers in our life. And visit the website: www.laserfest.org

Our group serves as a forum for scientists working on few-body problems in different disciplines to share research contributions of common interest. Our governance, which includes officers from the atomic physics, chemical physics, and nuclear physics communities, reflects the interdisciplinary nature of the GFB membership. Our group has a little over 300 members from all over the world.

Today, few-body physics is the topic of a number of regular international conferences, which include the international IUPAP conferences on few-body problems in physics, the Asia-Pacific conferences on few-body problems in physics, and the European conferences on few-body physics. In 2010 and 2011, few-body physics will be featured at upcoming programs listed under [Other Meetings](#) in this newsletter. in this newsletter.

We are proud that in these 26 years many of our members have been elevated to APS Fellows. This year we are pleased to congratulate *D. W. Sprung*, who was recognized as an APS Fellow.

Membership Drive

GFB is active in promoting its current members and in increasing its membership. The group offers many benefits, some of which are described in this newsletter.

We ask all our members to identify potential new members and encourage them to join GFB. Please encourage in particular your graduate students, especially those who are already signing up for APS, to choose GFB as one of their units. (Students can sign up for two free units, which remain free even past the first year.) It is easy to add a Topical Group to your membership:

visit <http://www.aps.org/membership/units/join-unit.cfm>. This page also contains information regarding Topical Groups for student members.

The GFB Nominating Committee (Wayne Polyzou, Doerte Blume, Richard Furnstahl, Ron Gilman, and Harald Griesshammer) has prepared a list of candidates running for Vice-Chair

and the Executive Committee. You will have just received the ballots and I urge you to cast your vote. It will take you just a few minutes to look over the information about the candidates and cast your ballot.

[A. R. P. Rau](#) Chair, GFB
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● **CALL FOR APS FELLOWSHIP NOMINATIONS**

A major benefit to the members of the topical group is that they can be nominated through GFB to become Fellows of the APS. The number of nominations depends crucially on our total membership. We had two new Fellows last year (see below).

Please consider nominating colleagues worthy of this distinction. Current APS members (and their affiliations) can be found on the [APS Membership website](#), while Fellows are listed on the [Fellowship website](#). Members from under-represented groups should not be forgotten. Note also that if we nominate distinguished members from foreign institutions we might be able to promote more members using leverage of co-sponsorship with the Forum for International Physics (FIP).

Information regarding the nomination procedure is available at the APS Fellowship website. The DEADLINE for nominations through GFB is April 1st. Please make sure that the full package has been submitted to the APS website before this date.

Information regarding the nomination procedure and the necessary forms can be easily obtained through the APS Fellowship website. (www.aps.org/programs/honors/). The **deadline** for nominations for our Topical Group is this year April 1. Please make sure the full package has been submitted to the APS before this date.

This year's Fellowship Committee was chaired by Hossein Sadeghpour from ITAMP. Next year's committee will be chaired by Calvin Howell from Duke University.

CONGRATULATIONS TO OUR NEW FELLOWS

Congratulations to Donald W.L. Sprung from McMaster University who was elected to Fellowship in the APS under the auspices of the GFB.

His fellowship citation reads

For his many important contributions to the understanding of nuclear dynamics, including the development of the first realistic soft-core two-nucleon interaction and the identification of the role of long-range interactions in the deuteron.

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● APRIL MEETING

Every year GFB sponsors sessions at APS meetings, which highlight work by, and of particular interest to, its members. GFB will have two sessions at the 2011 APS April meeting, which will be held in Anaheim, April 30 - May 3. Please also plan to attend the GFB business meeting. At the last meeting, held in Washington, D.C., in February 2010, our Topical Group sponsored two symposia jointly with the Division of Nuclear Physics (DNP):

- **Session H6 Universality in Few-Fermion Systems**
Chair: Daniel Phillips (Ohio University):
Universal Three-Body Bound States of Ultracold Fermionic Atoms: Kenneth O'Hara
Universal interactions in atomic and low-energy few-nucleon systems: Ionel Stetcu
Large Scattering Lengths, Universality, Correlations and Few-Nucleon Systems:
Harald Griesshammer
- **Session Q2 Fundamental Symmetries (in Few-Body Systems)** Chair: Allena Opper (George Washington University):
Measuring the Neutron Lifetime: Jeff Nico
Results from a Search for the Permanent Electric Dipole Moment (EDM) of ^{199}Hg : Blayne Heckel
CP-violating Moments in Few-body Systems: Anna Hayes

In addition, thanks to the efforts of Harald Griesshammer, there were also three mini-symposia and one contributed session with joint GFB and DNP sponsorship:

- **Session A7 Mini-Symposium on Electromagnetic Reactions Involving Light Nuclei I**
Chair: Harald Griesshammer (The George Washington University):
- **Session K7 Mini-Symposium on Electromagnetic Reactions Involving Light Nuclei II**
Chair: Ron Gilman (Rutgers University):
- **Session S7 Mini-Symposium on Electromagnetic Reactions Involving Light Nuclei III**
Chair: Mohammad Waseem Ahmed (Duke University):
- **Session X7 Few-Body Theory**
Chair: Ionel Stetcu (University of Washington):

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● OTHER MEETINGS

2010 Fall Meeting of the APS Division of Nuclear Physics
will take place in Santa Fe, NM, November 3 - November 6, 2010

42nd Annual Meeting of the Division of Atomic, Molecular and Optical Physics
will take place in Atlanta, GA, June 13 - 17, 2011

2011 Fall Meeting of the APS Division of Nuclear Physics

will take place in East Lansing, MI, November 2 - 5, 2011

In 2010 and 11, few-body physics will be featured at two upcoming INT programs

- XXI-st EUROPEAN CONFERENCE ON FEW-BODY PROBLEMS IN PHYSICS, August 29 - September 3, 2010, Salamanca, Spain
- ["N-N INTERACTIONS AND THE NUCLEAR MANY-BODY PROBLEM"](#) a international meeting at the Tata Institute of Fundamental Research, Mumbai, India, November 22-27, 2010.

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● CANDIDATES BIOGRAPHIES AND STATEMENTS

● CANDIDATES FOR VICE-CHAIR

Calvin Howell

Duke University & TUNL/FEL

Biography

Calvin Howell received his B.S. degree from Davidson College in 1978 and obtained his Ph.D. degree from Duke University in 1984. He is a Professor of physics at Duke University and the Director of the Triangle Universities Nuclear Laboratory. He holds Adjunct Professorships in the Medical Physics Program at Duke University and in the physics department at North Carolina Central University. He is a Fellow of the American Physical Society (APS). His research includes the study of fundamental properties of nuclear systems with focus on few-nucleon systems, plant physiology using radioisotopes and applications of nuclear physics in the areas of national security, nuclear energy and medicine. He has coauthored more than 110 articles in scientific journals and has held Visiting Scientist positions at Los Alamos National Laboratory, the Stanford Linear Accelerator Center and Jefferson Laboratory.

Professionally Howell has served the physics community extensively as a Nuclear Physics Program Director at the National Science Foundation (NSF), as a member of the Department of Energy (DOE)/NSF Nuclear Science Advisory Committee, as a member of the Executive Committee of the Division of Nuclear Physics of the APS, as chair of the Executive Committee of the Southeastern Section of the APS, as chair of the APS Committee on Minorities, and as a member of numerous NSF and DOE review and planning panels.

Candidate's Statement

Last year, 2009, was the 25th anniversary of the APS Topical Group on Few-Body Systems and Multi-particle Dynamics (GFB). This anniversary year was one of celebration and reflection. The GFB community over the last 25 years has continuously updated the

collective goals for the field and has done a remarkable job of staying the course. There are many accomplishments over the last 25 years in both nuclear and atomic physics to tout.

The success of the GFB is in large part attributable to the collective wisdom of this community to organize activities around the inherent interdisciplinary nature of few-body physics. As Chair of GFB I will promote activities that continue this strong tradition in conference and meeting programs and will look for opportunities to broaden the scope of discussions beyond nuclear and AMO. As with all subfields, we must continuously evaluate the relevance of our pursuits in the context of broader scientific questions and goals. I will encourage workshops and meeting sessions that discuss the universal applications of phenomena in few-body systems and the impact of findings in few-body systems to phenomena at disparate distance and energy scales, e.g., nuclear structure in neutron stars.

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Peter Tandy

Kent State University

Biography

Peter Tandy is Professor of Physics at Kent State University, which has been his academic home since 1979. His research, funded throughout this time by the NSF, is focused upon theoretical descriptions of the quark and gluon structure of hadrons and their interactions. While based at Kent State University, he has, at various times, made administrative contributions as Chair of the Department of Physics, Director of the Center for Nuclear Research, and Acting Vice-President for Research, and held visiting scientist positions at Los Alamos National Laboratory, University of Maryland, TRIUMF at Vancouver, and the University of Adelaide.

Tandy's initial publications, resulting from his PhD in 1972 at the Flinders University of South Australia, addressed the classic few-body problem of three nucleon scattering. While holding post-doctoral positions at the University of Surrey (UK), the University of Maryland, and a Research Fellowship at the Institute of Advanced Studies at the Australian National University, his research into many-particle descriptions of nuclear reactions and relativistic mechanisms of nucleon-nucleus scattering retained an underlying basis in few-body dynamics. Although the present research program uses relativistic quantum field theory, it is dominated by a few dressed dynamical degrees of freedom. Tandy has published about 100 papers of all types; he has been elected Fellow of the APS, Fellow of the Australian Institute of Physics, and has been awarded the Distinguished Scholar Award of Kent State University.

Candidate's Statement

The interdisciplinary mission of this topical group is most important. Too often we are focused on specialized meetings and workshops and lose the benefit of contrary viewpoints, challenges and ideas from those experienced in allied fields: atomic, molecular, quantum chemistry, nuclear, particle, etc. In our various university departments we recognize the value

of broad colloquium style presentations as well as specialized seminars. The few-body topical group of the APS provides a similarly valuable service by organizing meeting sessions devoted to capturing those colloquium-style common elements that so many of us employ in the treatment of dynamics. My own research started many years ago with the Faddeev style dynamical treatment of three-nucleon scattering, progressed through nuclear reaction and scattering theory, and for the past two decades has been concerned with relativistic quantum field theory QCD as the basis for models of hadronic physics. I am all too aware that I end up with a system of a few dynamical degrees of freedom describing quasi-particles (dressed quarks and gluons) that accounts for a certain infinity of elementary degrees of freedom owing to the relativistically covariant nature of the approach.

If elected Vice-Chair, I would be anxious to encourage and facilitate this broad reflection mission of the group through promotion of few-body sessions at meetings and conferences, and the search for the excellent speakers that such a session requires.

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● CANDIDATES FOR EXECUTIVE COMMITTEE

Werner Boeglin

Florida International University

Biography

Dr. Werner Boeglin is a Professor of Physics at the Florida International University (FIU) in Miami, FL. He received his Ph.D. in Experimental Nuclear Physics from the University of Basel, Switzerland in 1986. He completed his undergraduate studies at the same institution in 1980 with a Diploma. Following his Ph.D. he was a post doctoral fellow and later a research scientist at the Laboratory of Nuclear Science at the Massachusetts Institute of Technology. In 1990 he started working at the University of Mainz in Germany, where he stayed for five years working with the newly completed Mainz Microtron. Since 1995 he has been a faculty member at FIU. He carries out his experimental research at Jefferson Lab. Since his time at MIT his research has been focused on the exclusive electro-disintegration of the deuteron in order to study the reaction mechanism and the structure of the deuteron at short distances.

Candidate's Statement

Few body systems have always been of central importance in physics and it is important that one realizes the abundance of few body systems in nature at all scales. At a large scale this is exhibited by the abundance of binary stars. At the molecular level molecules such as hydrogen and water play a very special role, and at the atomic level again Hydrogen and Helium atoms are fundamental systems. In nuclear physics two and three body systems such as the deuteron and ^3He provide important testing grounds for our understanding of the nucleon nucleon interaction and the structure of nuclei from 'first principles'. In particle physics the structure of hadrons is given by two (mesons) and three body (baryons) systems.

The special role that few body systems play needs to be promoted in order to interest students and researchers in this field. In addition cross disciplinary collaboration should be encouraged. This would then have a very positive impact on a wide range of research areas.

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Scott Bogner

Michigan State University

Biography

Scott Bogner is an Assistant Professor of Physics at the National Superconducting Cyclotron Laboratory at Michigan State University. He received his Ph.D in Physics from SUNY Stony Brook in 2002 and did postdocs at the Institute for Nuclear Theory (University of Washington) and Ohio State University before coming to MSU in 2007. He has published ~27 peer-reviewed papers and given ~35 invited talks, seminars, and colloquia. His current research focuses on the application of renormalization group (RG) and effective field theory (EFT) methods to nuclear few- and many-body problems.

Candidate's Statement

The dividing line between few- and many-body physics has become ever more blurry in recent years. This is increasingly evident in nuclear theory, where the emerging frontier of calculating and understanding the role of three- and higher-body forces in systems beyond light nuclei inextricably links few- and many-body physics. It is also evident in cold atom physics, which in turn share certain universal aspects with low-density neutron matter and loosely bound halo nuclei. Together with the fact that RG and EFT methods (which are used in many areas of theoretical physics) play an important role in the description of such few- and many-body systems, it is advantageous to foster interdisciplinary collaborations between the different communities. As a member of the Few-Body Topical Group Executive Committee, I would bring a nuclear many-body perspective to this interdisciplinary dialog. My primary points of emphasis as a member of the committee would be to encourage increased interactions between few- and many-body practitioners, and to advocate measures aimed at attracting and developing young researchers.

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Pieter Maris

Iowa State University

Biography

Dr. Pieter Maris got his PhD in theoretical physics in 1993 from the University of Groningen in the Netherlands. His first postdoc was in Nagoya, Japan, with JSPS fellowship, and since 1996 he has been working in the US (at Argonne National Laboratory, Kent State University,

North Carolina State University, and University of Pittsburgh). Currently he is at Iowa State University in Ames, IA.

His research area is in particle and nuclear physics which a strong computational emphasis; over the years he has developed a number of parallel codes for bound state problems in particle and nuclear physics. He is an expert in applications of the fully covariant Bethe-Salpeter equation to hadron physics, including extensions to three-quark bound states. He is also interested in few-body bound state in light-front coordinates. He is a member of the SciDAC UNEDF collaboration, where his main focus is on (non-relativistic) ab-initio nuclear structure calculations. He has (co)authored more than 45 refereed publications in particle and nuclear physics, with more than 2,000 citations.

Candidate's Statement

The Topical Group on Few-Body Physics plays an important role in bringing together people working on Few-Body problems in different fields of physics. As a member of the Executive Committee of the group I would encourage collaborations and exchange of ideas between related fields (such as particle, nuclear, and atomic physics). I would also like to share my experiences with numerical solution of bound state problems on modern supercomputers, and promote the efficient use of the available computational resources by the Few-Body Physics community.

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